NRC000014
Corrected 01-16-2009
NUREG-1087

Final Environmental Statement

related to the operation of
Vogtle Electric Generating Plant,
Units 1 and 2

Docket Nos. 50-424 and 50-425

Georgia Power Company, et al.

U.S. Nuclear Regulatory Commission

Office of Nuclear Reactor Regulation

March 1985

NOTICE

Availability of Reference Materials Cited in NRC Publications

Most documents cited in NRC publications will be available from one of the following sources:

1. The NRC Public Document Room, 1717 H Street, N.W.
   Washington, DC 20555
2. The NRC/GPO Sales Program, U.S. Nuclear Regulatory Commission,
   Washington, DC 20555
3. The National Technical Information Service, Springfield, VA 22161

Although the listing that follows represents the majority of documents cited in NRC publications, it is not intended to be exhaustive.

Referenced documents available for inspection and copying for a fee from the NRC Public Document Room include NRC correspondence and internal NRC memoranda; NRC Office of Inspection and Enforcement bulletins, circulars, information notices, inspection and investigation notices; Licensee Event Reports; vendor reports and correspondence; Commission papers; and applicant and licensee documents and correspondence.

The following documents in the NUREG series are available for purchase from the NRC/GPO Sales Program: formal NRC staff and contractor reports, NRC-sponsored conference proceedings, and NRC booklets and brochures. Also available are Regulatory Guides, NRC regulations in the *Code of Federal Regulations,* and *Nuclear Regulatory Commission Issuances.*

Documents available from the National Technical Information Service include NUREG series reports and technical reports prepared by other federal agencies and reports prepared by the Atomic Energy Commission, forerunner agency to the Nuclear Regulatory Commission.

Documents available from public and special technical libraries include all open literature items, such as books, journal and periodical articles, and transactions. *Federal Register* notices, federal and state legislation, and congressional reports can usually be obtained from these libraries.

Documents such as theses, dissertations, foreign reports and translations, and non-NRC conference proceedings are available for purchase from the organization sponsoring the publication cited.

Single copies of NRC draft reports are available free, to the extent of supply, upon written request to the Division of Technical Information and Document Control, U.S. Nuclear Regulatory Commission, Washington, DC 20555.

Copies of industry codes and standards used in a substantive manner in the NRC regulatory process are maintained at the NRC Library, 7920 Norfolk Avenue, Bethesda, Maryland, and are available there for reference use by the public. Codes and standards are usually copyrighted and may be purchased from the originating organization or, if they are American National Standards, from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

GPO Printed copy price: $9.50

NUREG-1087

Final Environmental Statement

related to the operation of
Vogtle Electric Generating Plant,
Units 1 and 2

Docket Nos. 50-424 and 50-425

Georgia Power Company, et al.

U.S. Nuclear Regulatory Commission

Office of Nuclear Reactor Regulation

March 1985

U.S. EPA for right-of-way use are applied, application is done by a licensed pesticide applicator, spraying is limited to times when the wind does not exceed 3.2 km (2 miles) per hour, and the application rate is in accordance with label directions. Herbicide spraying of many types of rights-of-way is a common practice throughout the United States (Voorhees, 1983). Such spraying kills primarily broadleaved plants and often allows grasses to become the dominant vegetation on the right-of-way. Herbicides commonly used on power line rights-of-way have low toxicity to wildlife, and there are no reports of significant toxicity-related impacts on wildlife in the voluminous literature on herbicide use (Tillman, 1976a; U.S. Fish and Wildlife Service, 1979; Arner and Tillman, 1981; Brown, 1978; Buffington, 1974; Cody, 1975; and Voorhees, 1983).

In the FES-CP (page 5-16), the NRC staff stated that no spraying could be done from helicopters. However, after reviewing the voluminous literature that has been published on herbicides since issuance of the FES-CP in 1974, the staff now finds that spraying from helicopters can be done with an acceptable level of environmental impact in places where such spraying is clearly justified and EPA-approved herbicides are used.

5.5.2 Aquatic Resources

The effects on aquatic biota in the Savannah River as the result of operation of the Vogtle plant will be associated with chemical/biocide discharges, thermal discharges, and the intake effects of entrainment and impingement. Organisms entrained in the discharge plume will experience some effects from elevated temperature and chemical discharge. Impacts of impingement will be mitigated by the lateral fish escape passageway that has been installed since the FES-CP assessment. Entrainment effects are expected to be minimized by the design of the intake structure. GDNR has tentatively determined that the proposed cooling water intake structure complies with Section 316(b) of the Clean Water Act (see item 6 in the fact sheet issued with the draft NPDES, in Appendix E).

5.5.2.1 Chemical and Biocide Discharges

The chemical constituents in the discharge are summarized in Section 4.2.6 and Table 4.5. The concentration of the chemical constituents in the discharge depends upon the number of cycles of concentration. The predicted concentrations in the plant discharge are not significantly different from those evaluated in the FES-CP, although the amount discharged will be less because of the reduction in size of the plant from four units to two units. The discharge concentrations of chemicals, other than residual chlorine, are not expected to result in adverse effects on river biota. The discharge is less than 1% of the guaranteed minimum flow of the river at the site. Mixing of the plant discharge with the river flow is not expected to result in adverse impacts on river water quality or river biota.

According to state water quality standards, deleterious substances are not to be present in amounts that would render the waters injurious to humans, fish, or other beneficial organisms. A water quality standard for total residual chlorine (TRC) for the protection of fresh water organisms, other than salmonid fish, was established by EPA (1976), under the provisions of the Clean Water Act; the standard is 0.01 mg/L. This level was estabished on the basis of a review of toxicity studies conducted by EPA researchers and others, and is applicable to a continuous exposure to residual chlorine. Other continuous

exposure safe concentrations or chronic toxicity thresholds have been set by Brungs (1973) and Mattice and Zittel (1976) for freshwater organisms. The limitation recommended by these researchers is 0.003 mg/L for both studies. Exposure to residual chlorine at or below this level would not be expected to produce mortality in aquatic organisms. These criteria considered cold water (salmonid) fishes as well as warm water organisms, however, and may be unduly restrictive for the organisms in the Savannah River.

For comparison, the EPA limitation for salmonid fish is 0.002 mg/L. Other studies by Dickson et al. (1974) and Brooks and Seegert (1978) examined the effects of intermittent exposures of warm water fishes to residual chlorine. These studies concluded that exposure to residual chlorine not greater than 0.2 mg/L TRC intermittently for a total time of up to 2 hours per day would "probably be adequate to protect more resistant warm water fish such as the bluegill" (Dickson et al., 1974); and that intermittent exposures to combined available chlorine totaling 160 minutes would not produce mortality to the most sensitive of 10 warm water fishes tested at concentrations at or below 0.21 mg/L, respectively. The most sensitive species in the latter study was the emerald shiner. The other species tested were the common shiner, spotfin shiner, bluegill, carp, white sucker, channel catfish, white bass, sauger, and freshwater drum.

The most restrictive chlorine water quality criterion for a fresh warm water fishery is that set by EPA (EPA, 1976), 0.01 mg/L. As stated above, the applicant estimates that the proposed operation of the Vogtle plant will result in a TRC concentration in the plant blowdown of 0.1 mg/L. The applicant's thermal analysis of the discharge indicates a diluting of discharge constituents of 8. within the 2.7C° (5F°) isotherm volume of the thermal plume, under minimum river flow conditions. This dilution would reduce TRC to nearly the EPA criterion (0.012 mg/L). On the basis of known reactivity of residual chlorine with constituents in natural waters, the staff's confirmatory review of the applicant's thermal analysis, and the average flow of the river at the site, the staff concludes that the discharge concentration of 0.1 mg/L TRC expected by the applicant will not result in unacceptable adverse impacts on the biota of the Savannah River.

5.5.2.2 Thermal

The staff review of the single-port discharge for Amendment 3 to the Vogtle construction permits found that its operational effects would be similar to those of the multiport diffuser, except that the single-port discharge is nearer the shoreline and, under certain operating conditions, the thermal plume may reach both the surface and the bottom. The benthic community will be affected where the plume reaches and scours the bottom; however, the impact should be minimal because of the shifting-sand substrate, which provides poor habitat for benthic organisms (Hynes, 1970). The plume will affect a benthic area along a centerline trajectory starting approximately 7.6 m (25 feet) from the discharge port for a distance of about 9 m (30 feet). The plume is expected to surface approximately 9 m (30 feet) from the discharge port. Because of the smaller size and the new orientation of the discharge plume using the single-port discharge rather than the multiport design, there should be a greater zone of passage for migratory fish along both the Georgia and South Carolina sides of the river (ibid).

5.5.2.3 Entrainment

At a maximum withdrawal rate of 3.4 m^3/s (120 cfs) and a minimum guaranteed river flow of 164 m^3/s (5800 cfs), a maximum of 2% of the river flow will pass through the plant. Assuming a uniform distribution of drift organisms, this withdrawal would remove approximately 2% of the drift community as it passes the plant. This removal rate should have little if any effect on the drift organisms and the aquatic community feeding on plankton in the vicinity of the plant because of recruitment from upstream, from marsh and swamp areas, and from side streams. Under average flow conditions (292 m^3/s (10,300 cfs)) and maximum withdrawal (3.4 m^3/s (120 cfs)), the removal rate would be 1% of the drift organisms. The maximum removal rate calculated in FES-CP Section 5.5.2.2 for four operating units was 3.5%.

FES-CP Section 5.5.2.2 states that there are no streams entering the river on the Georgia side immediately upstream of the intake structure. The intake canal is designed with (1) a sediment deposition area and weir at the mouth of the intake canal, (2) a short approach distance to the intake structure, and (3) a low intake velocity (see Section 3.4). These design features should help minimize the number of fish eggs and larvae in the water being drawn into the intake structure, thereby minimizing the effects of entrainment. All eggs and larvae that pass through the cooling system are expected to die. No unique spawning areas for anadromous fish have been identified in the immediate plant vicinity. Beaverdam Creek, other tributary streams in the midreach section of the Savannah River, and upstream portions of the river provide suitable habitat for spawning of anadromous species (Wiltz, 1982). There should be no significant adverse impact on resident fish species in the plant vicinity as the result of entrainment.

5.5.2.4 Impingement

The design of the intake structure has been modified since the FES-CP was issued and has been reviewed by the staff (Tedesco, April 1981). The design includes a 126-m (414-foot) approach canal with a skimmer weir at the mouth, a weir in the canal to trap sediment, flow guide vanes, and a fish escape gap. The weirs are designed to minimize sediment transport to the intake structure and the weirs and guide vanes are designed to provide uniform flow distribution through the canal. At the downstream end of the river weir there is a 0.9-m (3-foot) opening that will provide a fish escape route. Flow in the fish gap will be from the canal to the river, based on design hydraulics.

The Vogtle intake will have a lower water withdrawal rate, lower intake velocities, and a shorter approach canal than the Savannah River Plant, so impingement should be less. Because of the intake weirs, the upper 1.8 m (6 feet) of the river water will be selectively withdrawn by the intake structure; thus, biota in this water would be more susceptible to transport into the intake canal.

Because the eggs of most freshwater fish are adhesive, demersal, or semi-buoyant, the eggs and early larval stages should not be susceptible to transport into the intake canal. Eggs of the blueback herring and the American shad, (anadromous species that spawn upstream) also are semi-buoyant so they too should not be susceptible to transport into the intake canal. As the larvae of both groups begin to feed throughout the water column, they will be more susceptible to being carried into the intake canal. Impingement impacts on the aquatic biota

in the Savannah River in the vicinity of the Vogtle plant should be less than those calculated in FES-CP Section 5.5.2.1 because of (1) the low intake velocities (0.15 m/sec (0.5 ft/sec)) across the trash rack and 0.2 m/sec (0.7 ft/sec) across the traveling screens (which help to minimize impingement (Boreman, 1977)), (2) the fish escape route built into the weir design, and (3) the reduction in water use as a result of the cancellation of two of the Vogtle units.

Studies at the Savannah River Plant showed that 36 species and a total of 469 fish were impinged over a 12-month period in the three intake canals (Wiltz, 1981). A 1978 study at that plant noted that 347 fishes of 35 species were impinged; of these, no species constituted more than 10% of the sample (McFarlane et al., 1978). The predominant species impinged were sunfish, channel catfish, and yellow perch. Twelve species of centrarchids (46% of the sample), 5 species of ictalurids (catfish, 13%), and 3 species of clupeids (shad/herring, 15%) were impinged (Wiltz, 1981).

Fewer fish are expected to be impinged at the Vogtle plant than at the Savannah River Plant because (1) the area of the intake canal is smaller than the area of the Savannah River Plant canals, (2) there is only one intake canal for Vogtle, and (3) the velocity in front of the Vogtle intake screens will be about one-fourth to one-third that in front of the Savannah River Plant screens (ibid). The velocity across the traveling screen, which is lower than reported in FES-CP Section 5.5.2.1, should further reduce the impingement of Savannah River fishes by the Vogtle intake structure. Thus, the staff concludes that there will be no significant effects on the fishes of the Savannah River as the result of impingement.

5.6 Threatened and Endangered Species

5.6.1 Terrestrial

For most of the threatened and endangered species found in the region (Section 4.3.5), the principal potential impacts are associated with destruction of habitat during clearing and construction. Operation of the plant and power lines has little potential to affect these species. Exceptions are the American alligator, which occurs on the site, and the eastern indigo snake, which may occur on the Vogtle-to-Thalmann power line route.

Habitat management activities at the site and releases of cooling tower drift to the atmosphere and blowdown to the Savannah River should not affect alligator habitat or alligator populations on or near the site. Reclearing of vegetation during right-of-way maintenance may affect habitat of the indigo snake and could result in death of individuals that are in the way of the reclearing vehicle.

5.6.2 Aquatic

The shortnose sturgeon, Acipenser brevisostrum LeSueur, is the only aquatic species on the Federal list of endangered species that is expected to occur in the vicinity of the Vogtle plant.

No specimens of the shortnose sturgeon have been collected by the applicant in aquatic sampling associated with baseline (pre-construction) and construction phase (pre-operational) environmental monitoring programs. However, studies